

Environmental Issues and the South-North Water Transfer Scheme of China

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Abstract: This paper mainly deals with key issues of China's water resources with special reference to the sustainability. Based on water demand and water supply the author stressed major approaches to solve the water shortage problems in China's 21st century which mainly include water saving, South-To-North water transfer schemes (SNWTS) with special reference to environmental issues as well as management of water resources in China.

1. Water Deficits on the North China Plain

China has good resources of land and water. The problem is that they are often not in the same place. The south, which is water-rich, is too hilly for extensive farming. The North China Plain is flat, like France or the Ukraine, but lacks water. It produces 27 per cent of China's grain, but at the cost of serious stresses on its water resource. Deficits in the surface water supply have led to intensified use of the groundwater well beyond the "safe yield" where recharge balances withdrawal. Hence the water table has fallen greatly under both rural and urban areas ever since electric- or diesel-powered tubewells became widespread in the early 1970s. In addition to increased pumping costs and the need to bore ever deeper wells, consequences have included land subsidence, compressing the emptied aquifer in a number of areas and salt water intrusion in coastal areas.

In addition, areas in the lower reaches of the Huang (Yellow) River that have relied on diversions of its water for irrigation have suffered from increasingly long cut-offs in the river's flow as more and more water is used upstream^[1]. In 1997, a record year, the Huang failed to flow to the sea for 226 days, with the dry stretch reaching roughly 700 kilometres inland.

Water shortages affect more than crops. Pollutants from farm runoff and other sources remain highly concentrated when there is little water available to dilute them. Many people in north China drink water that is polluted by organics, minerals or nitrates. One solution to the problem of localized shortages is to transfer water from another basin. Many inter-basin diversion projects were undertaken in China prior to 1949, but for the most part these were on a rather small scale. Since the founding of the People's Republic a number of major inter-basin transfers have been developed to meet the requirements of economic development, especially those resulting from urbanization (see Table 1). Currently a number of very large transfers are being considered or developed from the Chang (Yangtze) River into the North China Plain. These are collectively known as the south-north water transfer schemes, and will be described below.

Inter-basin water transfers have mixed impacts on the natural environment. In one sense, the primary goal of south-north transfer is precisely to improve the environment in the receiving basin by

providing it with a stable source of water. Yet negative environmental impacts are foreseeable. These may be very costly, but they are hard to measure in monetary terms or to anticipate with absolute certainty. To a very large extent, the success of south-north transfers will depend on the balance of environmental effects which will fall on the water-exporting region, the water-transfer region, and the water-importing region, and will result from the physical, chemical, biological and socio-economic systems.

2. Routes for the South-North Water Transfers

Three general routes of south-north transfer schemes are currently under consideration, depending on which part of the Chang River system the water is diverted from: the east (in Jiangsu), the centre (in Hubei) or the west (in Qinghai). The middle route, now given priority, would transfer water from the Danjiangkou Reservoir on the Han River - a large tributary of middle reaches of the Chang - to supply Hubei, Henan, Hebei and ultimately Beijing and Tianjin, as well as the western part of the North China Plain along the way^[2]. In the long run, it may be necessary to divert additional water from the Sanxia (Three Gorges) Dam on the Chang River to the Danjiangkou Reservoir to meet the large water demands from the northern provinces.

The middle route. The conveyance canal of the middle route would begin at the Taocha water intake being built at the Danjiangkou Reservoir. It would then follow the southern and western edge of the Funiu and Taihang Mountains, and would terminate in Beijing's Yuyuantan Lake (see Figure 1). In order to supply water to Tianjin, a canal would have to be constructed extending eastward from Xushui county in Hebei province across the Hai River Plain.

The water source of the middle route, the Danjiangkou Reservoir, has an annual natural inflow of 41.1 billion cubic metres from a drainage area of 95,217 square kilometres. First-stage engineering works, which involve the construction of the 162-metre Danjiangkou dam with a total storage capacity of 17.45 billion cubic metres, have been completed. The second-stage engineering works, which have been approved, would raise the dam to 176.6 metres in order to increase the total storage capacity to 29.1 billion cubic metres.

Supplemental water may be pumped up to Danjiangkou from the reservoir created by the Sanxia Dam or from downstream Shashi. This water would flow "uphill" along the Han River into the Danjiangkou Reservoir, from which it would enter the main canal of the middle route. An alternative plan is to pump water diverted from the Han River at Xiangfan into a tributary, the Tangbai River, and then along the Bai River into the main canal. The main portion of the middle route is now at the primary design stage, with implementation likely to start in the near future.